

C-A Unreviewed Safety Issue (USI) Form

Title of USI: **AGS Cold Snake Magnet System**

Description of USI (use attachments if necessary):
See attached

Title and Date of Relevant SAD:

Safety Assessment Document Linac, Tandem Van De Graaff, Booster, AGS, RHIC, Transfer Lines and Experimental Areas, Revision 2, August 2004

Committee Chair or ESHQ Division Head must initial all items. Leave no blanks:

ITEM	APPLIES	DOES NOT APPLY
Decision to not revise the current SAD and/or ASE at this time: The hazard associated with the proposed work or event is covered within an existing SAD and/or ASE. <i>Safety Assessment Document Linac, Tandem Van De Graaff, Booster, AGS, RHIC, Transfer Lines and Experimental Areas, Rev. 2, 8/2004</i> SAD Title and Date: This Form and attachments, if necessary, shall be used to document the USI until the next revision of the appropriate SAD.	<i>Rek</i> <i>Rek</i>	
Decision to submit a revised SAD and/or ASE to the BNL ESH Committee: The hazard associated with the proposed work is not appropriately included in an SAD.		<i>Rek</i>

Raymond Karol

Signature of C-A Committee Chair or C-A ESHQ Division Head

4-20-05

Date

Edward T Lissard

Signature of C-A Associate Chair for ESHQ

4-21-05

Date

AGS Cold Snake Magnet System

In April 2005, a new cold snake magnet system was installed in the A-20 position of the AGS ring. This superconducting helical dipole magnet helps preserve the polarization of a proton beam in the AGS and allows a high polarization in RHIC. The basic structure is similar to the RHIC snake magnets. The cryohead is mounted directly on the magnet vessel. The compressors are located outside the tunnel in the A-18 House.

The cold snake magnet is cooled to ~ 4 ⁰K using commercial cryo-coolers. The magnet is pre-cooled with liquid nitrogen. The potential for rapid energy release from ozone formed during the pre-cooling with liquid nitrogen during AGS beam operations was examined and found to be insignificant for polarized proton intensities^{1,2}.

Dose rates to workers in the tunnel during a release of the activated cryo-gasses was examined and found to be approximately 1.5 mrem/hr³. Releases to the environment during routine operations were also examined and found to be orders of magnitude below the 0.1 mrem/yr EPA criterion for continuous monitoring⁴.

During normal operation, the snake magnet contains ~ 109 L of LHe and a small amount of He gas. A new penetration was installed at the A-20 position to allow electrical cables and cryogenic pipe to connect from the magnet to the external refrigeration system and snake magnet power supplies. Calculations have shown that the dose rates at the exit of the penetration are acceptable⁵.

Dewars, located outdoors outside the AGS berm near the A-10 House are used to supply the liquid nitrogen and liquid helium for cool down and operations.

ODH hazards were reviewed⁶ and are controlled as follows;

1. During cool down and operation of the snake magnet, the AGS Ring is posted as ODH 0.
2. An ODH monitor, similar to those installed throughout the RHIC Ring is installed at the A-20 location to warn workers of a release of helium or nitrogen. The alarm is set at 18%. If the ODH monitor is inoperable, personnel entering the area near the snake magnet must wear portable oxygen monitors that alarm at 19.5%.

¹ CERN AT/95-06 (DI), CERN TLS-CFM 95-06, C. R. Gregory and C. W. Nuttall, Explosion Risks in Cryogenic Liquids Exposed to Ionising Radiation, March 28, 1995.

² Email from W. Meng to W. Glenn dated March 29, 2005, O3 Concern. Copy in ASSRC Minutes.

³ E. Lessard, An Estimation of Radionuclide Production in Nitrogen in the AGS Snake Magnet (Revision 2.0), March 29, 2005, see [NESHAPS Review for AGS Cold Snake](#).

⁴ E. Lessard and Ahmed Sidi-Yekhllef, An Estimation of Tritium Production in Helium in the AGS Snake Magnet, November 22, 2004, see [NESHAPS Review for AGS Cold Snake](#).

⁵ Minutes of the Radiation Safety Committee of November 1, 2004, Status of A-20 Penetration and the Relocation of the AGS Shutter.

⁶ Evaluation of ODH hazards by W. Glenn dated 4/20/05. Copy in the ASSRC Minutes.